U. S. DEPARTMENT OF AGRICULTURE.
BUREAU OF SOILS—MILTON WHITNEY, Chief.

SOIL SURVEY OF ST. JOHNS COUNTY, FLORIDA.

BY

ARTHUR E. TAYLOR, IN CHARGE, GROVE B. JONES,
E. C. HALL, AND CHARLES N. MOONEY.

W. EDWARD HEARN, INSPECTOR, SOUTHERN DIVISION.

[Advance Sheets—Field Operations of the Bureau of Soils, 1917.]

WASHINGTON:
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1920.

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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF SOILS,
Washington, D. C. July 16, 1919.

SIR: In the extension of the soil survey in the State of Florida work was undertaken in St. Johns County and completed during the field season of 1917.

The accompanying report and map cover this survey and are submitted for publication as advance sheets of Field Operations of the Bureau of Soils for 1917, as authorized by law.

Respectfully,

MILTON WHITNEY,
Chief of Bureau.

Hon. D. F. HOUSTON,
Secretary of Agriculture.

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SOIL SURVEY OF ST. JOHNS COUNTY, FLORIDA.

By ARTHUR E. TAYLOR, In Charge, GROVE B. JONES, E. C. HALL, and CHARLES N. MOONEY.—Area Inspected by W. EDWARD HEARN.

DESCRIPTION OF THE AREA.

St. Johns County is in the northeastern part of Florida. It is bounded on the north by Duval County, on the west by Duval, Clay, and Putnam Counties, on the south by Flagler County, and on the east by the Atlantic Ocean. The St. Johns River separates it from Clay County and in part from Putnam County, and Julington Creek forms part of the boundary with Duval County. The area of the county is about 607 square miles, or 388,480 acres.

In topography St. Johns County consists of an almost level area, commonly known as "flatwoods," broken along the coast and to a lesser degree along streams by low ridges. It comprises two topographic divisions, the low-ridge region bordering the coast and the flatwoods proper, which comprises the remainder of the county.

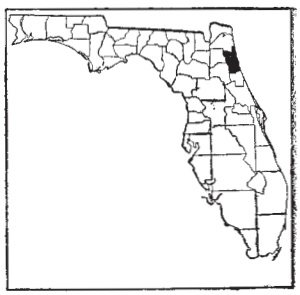


FIG. 1.—Sketch map showing location of the St. Johns County area, Florida.

The low-ridge region consists of a zone 3 to 5 miles wide, made up of low, narrow ridges, shallow valleys, and flatwoods. The ridges, which in many cases are remnants of old beaches, and the shallow valleys extend in a northwesterly and southeasterly direction, parallel with the coast line. Separated from the mainland by the Matanzas, North, and Guano Rivers is the barrier island, which ranges from a few hundred yards to more than 2 miles in width. This consists mainly of a number of low parallel ridges, of dunelike character, with intervening troughs, but in places the surface is almost flat and more or less dotted with poorly drained basins.

The flatwoods proper consist of an almost level region interrupted by slightly depressed areas, both large and small, shallow drainage ways, and low, gently undulating ridges.

The average elevation of the county, according to determinations made by the United States Geological Survey and railroad surveys, is about 27 feet. Elevations at some of the railroad stations are as

follows: Yelvington 32 feet, Hastings 9 feet, Elkton 33 feet, St. Augustine 5 feet, Sampson 36 feet, and Durbin 62 feet.

West of the principal watershed, which traverses the county in a northwesterly direction, the streams flow west and northwest to the St. Johns River; to the east the drainage is carried eastward and southeastward to the Atlantic Ocean. Comparatively small stretches of St. Johns County are well drained. These occur in high hammocks and undulating to gently rolling areas in the northwestern corner of the county between Julington and Cunningham Creeks, also along St. Johns River and Trout Creek, and in the ridges and along the larger streams in the low-ridge region in the eastern part of the county. The remainder of the county, with the exception of scattered, small, low, ridgy areas of about 10 to 100 acres, is poorly drained.

There are large areas in the county in which drainage is altogether lacking or only partially established. Such places are conspicuously marked by many large swamps and "bays," which often lie at the higher elevations. The largest of these, Twelvemile Swamp, in the eastern part of the county, is about 12 miles long and one-half mile to 3 miles wide. Other large swamps and bays, ranging from 1 to 10 square miles in area, are the swamps at the junctions of Deep and Tocoi Creeks with St. Johns River, Big Cypress Swamp, and Shingle and Big Trestle Bays. There are many other smaller swamps and bays, and cypress ponds, containing from 1 to 25 acres, are very numerous throughout the flatwoods region of the county.

The present streams are very sluggish and have not developed valleys. It is often difficult to determine the extent of the overflow land, owing to the gradual merging of the bottoms into the upland. In many cases the water spreads out over wide areas. Only the larger creeks and rivers have well-defined channels. The streams generally head in swamps or bays and in their upper reaches are intermittent. Both creeks and branches are fringed with a heavy growth of cypress and hardwood.

This is one of the oldest settled sections of the United States. Ponce de Leon in 1513 landed at or near the present site of St. Augustine. In 1565 a Spanish settlement was begun at St. Augustine under the leadership of Pedra Menedez. The Spaniards remained in control until 1763, when possession of this region was ceded to the English. It is said that Dr. Turnbull, with other English associates, in 1767, formed a colony of Europeans, consisting of over 4,000 people, mainly from the island of Minorca, but to some extent from the Grecian Archipelago and the island of Corsica, and settled on lands between St. Augustine and New Smyrna in Volusia County. The descendants of these Minorcans form a considerable part of the present population of St. Augustine and of much of the

northern part of the county. In 1784 Florida was receded by England to Spain, and Spanish occupation continued until 1819, when Spain ceded Florida to the United States, the transfer taking place in 1821. From this time there was a gradual incoming of settlers, mostly from the Carolinas and Georgia. The extension of settlement was slow and took place largely along the coast and the St. Johns River. During the last 20 years there has been a very rapid growth in the vicinity of Hastings, in the southwestern part of the county, due to the development of the potato-growing industry. The settlers in this section have come from all parts of the United States and Canada. There is also a large winter-resident population attracted hither by the mild climate.

The agricultural population of St. Johns County is very irregularly distributed, there being large uninhabited areas. The most densely populated regions are about Hastings, Elkton, and St. Augustine, along the Dixie Highway and the St. Johns River, and around the small towns on the Florida East Coast Railroad.

According to the 1910 census, St. Augustine, the county seat, has a population of 5,494. It is an important distributing, marketing, and banking center for the county, and is widely known as a winter resort. Hastings had a population of 399 in 1910, but has grown very rapidly since that time. It is the chief shipping point in the State for early Irish potatoes. Yelvington, Spuds, Armstrong Station, Elkton, Hurds, Hilden, and Durbin, on the Florida East Coast Railroad; Riverdale, Picolata, Tocoi, and Orange Dale, on the St. Johns River; and Fruit Cove and Pine Bluff, on Julington Creek, are shipping points.

The county is fairly well supplied with transportation facilities, no point being more than 10 miles from either a railroad station or a steamboat landing. Water transportation by shallow-draft boats is afforded in the eastern part of the county by the North, San Sebastian, and Matanzas Rivers and the Florida East Coast Canal; and in the western part by the St. Johns River and Julington Creek.

The Dixie Highway, which is a brick road, follows the Florida East Coast Railroad from the Duval County line to Hastings, and in addition connects Hastings and Bunnell, the county seat of Flagler County. Several roads reaching out from St. Augustine have a hard shell surface, and a number of other roads are graded. Settlement and "turpentine" roads extend into most sections of the county, except the larger swamp areas.

The principal towns are connected by telephone lines and these are being rapidly extended into the rural districts. Rural and star mail routes reach most of the settlements.

St. Augustine is the principal home market. Dairy products are shipped to all towns along the Florida East Coast Railroad. Early

Irish potatoes are shipped to all the large cities in the eastern part of the United States.

CLIMATE.

The climate of St. Johns County is about subtropical. It is characterized by long summers and short, pleasant winters. Occasionally during the months of December, January, and February there are periods of two or three days when the temperature may drop to near the freezing point. The lowest temperature recorded during a 68-year period of observation at St. Augustine is 13° F., and the highest 104° F. There is some variation in both temperature and precipitation between St. Augustine, in the east-central part of the county, and Federal Point, which is just west of Pine Island in the southwestern part of the county. Since there is little difference in elevation between these two points, the variation in climate is probably due to the proximity of the Atlantic Ocean. The mean annual temperature at St. Augustine is 69.4° F.

The average annual precipitation is 47.98 inches at St. Augustine and 57.3 inches at Federal Point. The wet season lasts from June to September, inclusive. The rainfall is lightest during the winter and spring months.

The average date of the last killing frost in the spring at St. Augustine is February 17, and of the first in the fall December 24. The latest killing frost recorded in the spring at this station occurred March 23, and the earliest recorded in the fall on November 10.

The following table, giving the normal monthly, seasonal, and annual temperature and precipitation, is compiled from the records of the Weather Bureau station at St. Augustine:

Normal monthly, seasonal, and annual temperature and precipitation at St. Augustine.

[Elevation, 10 feet.]

Month.	Temperature.			Precipitation.		
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year (1911).	Total amount for the wettest year (1880).
	°F.	°F.	°F.	*Inches.*	*Inches.*	*Inches.*
December	57.4	87	16	2.54	4.74	1.54
January	56.1	85	18	2.65	1.55	3.22
February	58.6	87	13	2.96	.00	6.91
Winter	57.4	87	13	8.15	6.29	11.67
March	63.0	94	26	2.95	1.30	1.30
April	68.2	93	38	2.72	.78	2.08
May	73.9	99	45	3.50	1.02	4.68
Spring	68.4	.99	26	9.17	3.10	8.06

Normal monthly, seasonal, and annual temperature and precipitation at St. Augustine—Continued.

Month.	Temperature.			Precipitation.		
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year (1911).	Total amount for the wettest year (1880).
	° *F.*	° *F.*	° *F.*	*Inches.*	*Inches.*	*Inches.*
June	79.0	10.4	54	5.04	4.73	5.95
July	80.8	101	62	5.51	1.22	11.09
August	80.6	101	63	5.95	5.48	8.20
Summer	80.1	104	54	16.50	11.43	25.24
September	7.4	100	51	6.72	1.14	2.57
October	72.2	98	38	5.12	5.83	14.29
November	64.0	97	26	2.32	3.80	5.51
Fall	71.2	100	26	14.16	10.77	22.37
Year	69.4	104	13	47.98	31.59	67.34

AGRICULTURE.[1]

During the occupation of this territory by the Spaniards, from 1565 till 1763, agriculture was only an incidental occupation, the settlers growing such crops as corn, beans, pumpkins, melons, and sugar cane for subsistence. The land farmed lay along the coast from St. Augustine to Matanzas Inlet. The gardens around St. Augustine, in addition to their use for growing vegetables, were well stocked with fruit trees, including the fig, guava, plantain, pomegranate, lemon, lime, citron, shaddock, bergamot, and Chinese and Seville oranges. To the Spaniard is due the introduction of tropical and semitropical fruits.

During the short period in which the English had possession, from 1763 to 1784, agriculture was rather extensively developed. The chief industry consisted of the production of indigo, and, judging from the ditches dug for drainage and probably irrigation, a large acreage was devoted to this crop. A writer (Williams) in 1837 states that indigo was the most certain crop, second to which was sugar cane, followed by corn, sweet potatoes, and cotton. Irish potatoes, pumpkins, squashes, melons, cucumbers, and numerous garden crops did well. This writer reports that on pine land where "cowpenning" was practiced upland rice yielded as much as 60 bushels per acre. He also reports that 2,000,000 oranges of the

[1]All census and other data used in this chapter apply to St. Johns County as it was constituted before the forming of Flagler County in June, 1917. Prior to this date St. Johns County extended south to Volusia County and included Bunnell, the county seat of Flagler County, Dupont, St. Johns Park, and Ocean City.

Chinese type were sent out of St. Augustine prior to 1835. It was in this year that very severe cold killed almost all the orange trees.

During the Spanish possession cattle and hogs were raised on a small scale. The whole country was an open range, as much of it is to-day, and the stock roamed at will. Stock raising became more important as new markets opened.

In the hammock land near the coast and along the St. Johns River sugar cane, cotton, and upland rice were grown extensively from 1830 to the time of the Civil War. The high prices after the war gave a strong impetus to the production of cotton. In the late seventies the growing of citrus fruit along the coast and larger streams began, and this industry developed very rapidly until the winter of 1895, when almost all the trees were killed. Late in the nineties the producing of early Irish potatoes for the northern markets was begun in the southwestern part of the county. This industry has grown rapidly and at the present time is the chief occupation of the county. In the eighties and nineties turpentining and lumbering were carried on rather extensively. These industries are still important, but the forest resources are rapidly being depleted.

According to the census there were 1,282 acres in corn in 1879, producing 13,997 bushels, and 273 acres in sweet potatoes, with a production of 29,259 bushels. There were 149 acres in sugar cane, which produced 13,930 gallons of sirup. Oats, rye, rice, hay, and cotton were grown to a much smaller extent. The value of orchard and market-garden products in 1879 was $32,284. By 1889 the area in corn had decreased to 881 acres, while that in sweet potatoes had increased to 357 acres. In that year sugar cane produced 91,400 pounds of sugar and 14,033 gallons of sirup.

At present Irish potatoes, corn, cowpeas, sweet potatoes, sugar cane, and oats are the principal crops. Velvet beans, peanuts, sweet clover; Bermuda, Sudan, Para, Johnson, Rhodes, and Natal grasses; saccharine sorghum; rye; soy, snap, and lima beans; and milo and kafir are grown to some extent. Velvet beans and oats are probably the most important of the minor crops, being grown for stock feed. Some citrus fruits and grapes are produced in certain localities, but the citrus industry has declined greatly in recent years.[1] Most of the farmers are engaged in raising hogs and some raise cattle. These animals are allowed to run on the open range. Dairying is practiced on a small scale. The principal wild grasses are wire grass and broom sedge in the flatwoods sections, needle grass and bunch grass in the fresh-water marshes, and salt weed and sword grass in the salt-water marshes.

[1] According to the Biennial Reports of the Florida Department of Agriculture, there were 65,000 bearing and 6,800 nonbearing orange trees in the county in 1913–14 and only 6,900 bearing and 1,300 nonbearing in 1917–18.

Irish potatoes are by far the most important crop. From only 128 acres in 1899 the area in potatoes increased to 3,585 acres in 1909, with a production of 456,808 bushels, and in 1917 it is reported that there were 12,000 acres planted, with a production of 1,962,500 bushels. The Spaulding Rose is the variety grown most largely.

Corn ranks next to Irish potatoes in importance. Most of the corn is used on the farm, chiefly for feeding stock but to some extent for making meal. More corn is shipped into the county each year than is shipped out. The 1910 census reports 3,442 acres in corn, with a production of 83,375 bushels.

Cowpeas rank next in importance. This crop is grown on almost every farm, mainly for hay, for hog pasture, and as a soil-improving crop.

Hay and forage crops are not important, although grown to a small extent on almost every farm. The 1910 census reports a total of 434 acres in cultivated grasses, with a production of 440 tons, and 641 acres in wild, salt, or prairie grasses, with a production of 1,063 tons. The greater part of the hay is fed on the farm to work stock and dairy cattle. A small amount is sold on the local markets, but this does not supply the demand and a large tonnage is annually imported. Cowpeas, cut with a volunteer growth of crab grass, is the leading hay crop of St. Johns County. Oats are cut in the heading stage and cured for hay. Sudan grass is reported to do very well, yielding about 2 tons per acre. Other hays that have been tried in an experimental way with some success are soy and velvet beans, Natal grass, Para grass, Rhodes grass, milo, kafir, and Japanese and Jerusalem cane. Very few farmers grow sufficient hay for their own use.

Sugar cane was grown on 136 acres in 1909. It was used principally for sirup and to a small extent for sugar.

Sweet potatoes and yams were reported on 369 acres in 1909 with a production of 46,170 bushels.

The principal orange groves are on the Bladen fine sandy loam near Hastings. Other groves are situated on the Norfolk fine sand. In 1909, according to the census, there were in the county 7,426 peach trees; 393 grapefruit trees, which yielded 355 boxes; 253 fig trees, with a production of 8,664 pounds; 1,239 grapevines, producing 71,370 pounds; 6 acres of strawberries, with a total production of 10,175 quarts; and 309 pecan trees, with a production of 2,684 pounds.

There are a few good dairies near Hastings and St. Augustine. The income derived from the sale of dairy products in 1909 amounted to $21,939. Jersey and Jersey grade are the leading types of dairy cows, and there are from 10 to 145 cows on each dairy farm. The dairy products are sold at towns along the Florida East Coast Rail-

road from St. Augustine to Miami. In addition to the native wire grass, broom sedge, crab grass, and beggar weed, pastures of cowpeas, oats, and Sudan grass are provided for the dairy cattle. The pasture grasses are supplemented with cottonseed meal, ensilage consisting of velvet beans and corn fodder or cowpea vines and corn fodder, concentrates, and dry feed. No systematic steps have been taken toward the eradication of the Texas-fever tick, but it is generally believed that dairying will be carried on much more extensively when eradication is effected. At present condensed milk and butter are shipped into the county in large quantities.

The raising of cattle for beef purposes is an important industry. There are a few farmers with herds ranging from 100 to 3,000 head, and many with from 10 to 50 head. These cattle are of an inferior type and in most cases receive no other feed than that obtained from the open range, which is generally poor but extensive. The importation of pure-bred bulls is discouraged by the presence of the Texas-fever tick.

In 1909, according to the census, there were 1,758 hogs sold or slaughtered in St. Johns County. The hogs are of better quality than other live stock. The importation of pure-blooded boars and sows has greatly improved the original razor-back type of hog. Poland-China, Berkshire, and Duroc-Jersey are the leading breeds. A large percentage of the hogs feed on the forage and mast of the swamps, hammocks, and flatwoods. Many farmers fatten their hogs by turning them into a field of cowpeas or peanuts or by feeding them corn. There is not sufficient pork and beef produced in St. Johns County to supply the local markets, and large quantities are imported.

Horses and mules are fed on about the same pasturage and roughage as the cattle, supplemented with corn, oats, alfalfa meal, and various mixed feeds. Not enough horses and mules are raised in the county to meet the local demand. A few small flocks of sheep and goats graze on the open range.

All the farmers recognize differences in the adaptation of soils to certain crops, and the majority are guided in a measure by such adaptation in selecting soils and crops. It is generally recognized that the Bladen fine sandy loam is the best Irish-potato soil, followed closely by the Bladen fine sand; that the Parkwood soils are best adapted to leguminous crops; and that the Norfolk fine sand is the best sweet-potato, sugar-cane, and citrus-fruit soil. Until the groundwater level is lowered, the hardpan broken up, and lime applied to correct the acidity, the St. Johns fine sand can not be cultivated with success. When adequate drainage is provided the Portsmouth and Scranton soils are considered well adapted to growing corn and potatoes, while the Plummer, because of its low organic content and

poorly drained condition, is classed as an inferior soil. The St. Lucie fine sand, because of the absence of humus, its leachy nature, and incoherent structure, is not farmed. Where drained and under cultivation the Peaty muck is found well adapted to onions, celery and corn.

The common method of preparing the seed bed for Irish potatoes is to break the land in November or December and throw it into beds 3 or 4 feet wide with disk cultivators. There are 10 or 12 of these beds in a plat. Between the plats are water furrows. These are connected at one end, and usually at both ends, with ditches, which are used for both drainage and irrigation. (Pl. 1.) The water for irrigating is supplied by artesian wells. From 1,000 to 2,000 pounds per acre of commercial fertilizer, containing about 6 to 7½ per cent available phosphoric acid and 4½ per cent ammonia, is applied to the bed early in January, after which the potatoes are planted in the top of the bed with a planter. The crop is cultivated with the disk cultivator and is sprayed frequently by some growers to counteract the blight, which may be serious, especially in wet seasons. The crop matures in about 90 to 100 days after planting. At the last cultivation of the potatoes corn is usually planted on the side of the bed without additional fertilizer. When the potatoes are dug the soil is turned about the corn, leaving it in the center of the bed, where the drainage is best. The corn is worked with disk cultivators and sweeps. At the last cultivation of the corn cowpeas are usually sown broadcast. Rice, however, is sometimes sown between the corn rows. When the corn is topped and the ears are snapped, hogs and cattle are often turned into the field to fatten on the cowpeas, but in many cases the cowpeas together with the volunteer growth of crab grass are cut for hay.

A few farmers have met with excellent success in growing Sudan grass. The seed is drilled in April in rows 3 feet apart, at the rate of 3 pounds to the acre. At the second cultivation seed is again drilled in between the rows, at the rate of 3 pounds per acre. It is considered best to plant after corn and velvet beans.

In sections of the county where farming is well developed the houses are generally large and well built. Most of the fields are fenced with barbed wire, though woven wire is coming rapidly into use. Improved farm implements are used by the majority of farmers, although some still use the 1-horse turning plow and the old type of small, straight plow and sweep, rather than the multiple-toothed cultivators that do so much better work. Mules are preferable to horses as work animals, as they are more easily kept and endure the warm weather better. The mules are rather small and the horses are of a light harness type. Oxen are used to a very small extent in clearing and breaking new land.

Systematic crop rotations covering a period of years are not followed by the farmers of St. Johns County, but two or three crops are grown in a season on the same field. Irish potatoes are usually followed by corn, and then the same year by a hay crop consisting of cowpeas and a volunteer growth of crab grass and beggarweed.

All farmers use commercial fertilizer for Irish potatoes. Corn, which generally follows potatoes, receives benefit from this fertilization. According to the census, $102,007 was expended for fertilizers in 1909, or $264.27 for each of the 209 farms reporting an expenditure. A ready-mixed fertilizer made of cottonseed meal, blood and bone, and acid phosphate, analyzing from 6 to 7½ per cent phosphoric acid and about 4½ per cent ammonia, is generally used for Irish potatoes. Very little stable manure is available, but "stock penning" is practiced extensively, the animals being kept in an inclosure of an acre or two which is changed when it is thought the soil has been sufficiently enriched. A few farmers have plowed under cowpeas and velvet beans and report a very material increase in the quantity and quality of the succeeding Irish potato crop as well as in the corn crop immediately following the potatoes.

Except during the potato harvest, little farm labor is hired. Most of the laborers employed are colored. Laborers hired by the month are paid from $25 to $35, while day laborers receive $1.50 a day for ordinary work and $2 for harvesting potatoes. The census reports a total expenditure of $120,823 for labor in 1909, or $313.01 per farm reporting.

With the division of many of the large land holdings into 5, 10, 20, and 40 acre tracts, the average size of the farms is steadily decreasing. The size depends mainly upon the character of the soil and to a lesser degree upon the condition of roads, nearness to towns, and transportation facilities. The smaller farms are located on the better drained tracts of the Bladen, Parkwood, and Norfolk soils. The 1910 census reports 386 farms in the county, comprising 8 per cent of the total land area. The average size of the farms in that year was 127.8 acres, of which 43.7 acres, or about 34.2 per cent, were improved land. The percentage of farms operated by owners was 89.9 per cent, by tenants 7.5 per cent, and by managers 2.6 per cent.

When land is rented, which is rather uncommon, the cash-rent system prevails, and from $5 to $20 is paid per acre. Where land is rented on shares the tenant usually furnishes all the labor and equipment and receives two-thirds of the crop.

Land values are steadily rising. Settlers are constantly coming from the north and west. The selling price of the better farming land ranges from $30 to $100 an acre for uncleared areas, the valuation depending on the quality of the soil, on the drainage, character

of the roads, and the distance from towns, schools, churches, and lines of transportation. Improved farms range in price from $100 to $500 an acre. The highest priced farms, excluding locations near the towns, are on the Bladen, Parkwood, Norfolk, and Scranton soils. Large areas, composed of the St. Johns, Leon, Plummer, and St. Lucie soils, Coastal beach, and Swamp, sell for $5 to $30 an acre. The average assessed value of land is given in the 1910 census as $32.79 an acre.

SOILS.

The formations of St. Johns County from which the soils are derived are largely Pleistocene deposits of Recent age, consisting of sediments that were laid down by water under varying conditions of deposition. These unconsolidated sands, sandy clays, and clays cover the entire county, except for a small area of Coquina on Anastasia Island, a number of small scattered beds of marl, recent fluvial deposits, and Peaty muck beds.

On the basis of origin the soils of St. Johns County may be classed in three general groups; sedimentary soils, or those derived from the underlying formation; alluvial soils, or those composed of materials laid down by the streams; and cumulose soils, or those derived mainly from decaying vegetation. The soils of these various groups are subdivided into series, which include soils having a common origin and similar characteristics of color, structure, topography, and drainage. The type differentiation within any series is based upon the texture, or the percentages of the different grades of sand and clay. Minor variations in the soil, not of sufficient importance to be designated as type differences, are indicated as phases.

The Bladen, Leon, Norfolk, St. Johns, St. Lucie, Scranton, Plummer, and Portsmouth soils owe their origin to the weathering of the unconsolidated sands and sandy clays. Most of the Parkwood fine sandy loam has been derived from unconsolidated sands and marly clay or marl, the unconsolidated sands resting upon the marl or marly clay. The Parkwood clay has to some degree originated from the marl or marly clay in situ. The Bladen fine sandy loam along Deep Creek, part of the swamp phase of the Bladen, Plummer, and Portsmouth fine sands along intermittent streams, and some of the Parkwood fine sandy loam where it occurs along stream courses have been modified by colluvial wash or alluvial deposits. The Peaty muck, the only representative of the cumulose group, has originated from the partial decomposition of organic material in the presence of water. In addition to the three general groups of soils there are mapped the types of Coastal beach, Swamp, Tidal marsh,

and Coquina, which do not represent sufficiently definite material to be classed as true soils.

The surface soils of the Bladen series are gray to almost black. The subsoils consist of gray to mottled brownish, yellowish, and grayish, plastic clay to loamy fine sand. The Bladen soils occupy flat basins which appear to have been recently under swampy conditions.

The Leon soils are gray to almost white. They are incoherent and sandy and are usually underlain, at depths ranging from 8 to 30 inches, by a dense, compact layer of fine sand, ranging in color from dark brown to black. White fine sand frequently underlies this "hardpan" layer within the 3-foot section. The Leon soils occur usually on sandy ridges.

The Norfolk series is characterized by light-gray to grayish-yellow surface soils and yellow subsoils. These soils occupy nearly level to gently rolling uplands.

The surface soils of the St. Johns series are dark gray to black and the subsoils are gray, except for a rusty-brown to black "hardpan" layer, which is usually from 3 to 10 inches in thickness and is encountered at a depth of 16 to 24 inches. These soils occupy low, flat, or slightly depressed areas.

The soils of the St. Lucie series consist of white, loose sand extending to a depth of more than 3 feet. They occur on ridges, invariably elevated above the associated flatwood soils.

The Scranton series has dark-gray to black surface soils. The subsoils are grayish or yellowish, with brownish-yellow mottlings. The surface is flat and drainage is imperfect.

The surface soils of the Plummer series are gray in color and very thin. The subsoils are light gray or dingy gray, often mottled with yellow. This series occupies flat, poorly drained areas of the flatwoods.

The Portsmouth soils are dark gray to black and have a high content of organic matter. The subsoils are gray. The surface is flat and the drainage is poor.

The surface soils of the Parkwood series are dark gray to brownish gray and are underlain by gray, dark-brown, or mottled gray and brown, calcareous clay, which rests upon dark-drab to almost white, marly clay. The surface is flat and drainage is very poor.

In following pages of this report the various soils of St. Johns County are described in detail and discussed in their relation to agriculture. The name and the actual and relative extent of each type are shown in the following table:

POTATOES ON THE BLADEN FINE SANDY LOAM.

Note the ridging of the rows, and the wide irrigating or drainage furrow in the center. This connects with irr

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
St. Johns fine sand	83,584	21.5	Bladen fine sandy loam	9,792	3.3
Bladen fine sand	57,344	20.6	Swamp phase	3,200	
Swamp phase	22,400		Portsmouth fine sand	2,944	2.9
Leon fine sand	51,072	13.6	Swamp phase	8,192	
Scrub phase	1,920		Peaty muck	5,824	1.5
Swamp	40,768	10.5	Scranton fine sand	5,696	1.5
Norfolk fine sand	15,232		Coastal beach	5,504	1.4
Flat phase	9,536		Parkwood fine sandy loam	3,648	0.9
Scrub phase	6,400	9.2	St. Lucie fine sand	2,240	0.6
Hammock phase	3,904		Coquina	512	0.1
Shell phase	576		Parkwood clay	320	0.1
Plummer fine sand	16,256	6.5	Total	388,480	.....
Swamp phase	9,024				
Tidal marsh	22,592	5.8			

BLADEN FINE SAND.

The Bladen fine sand consists of a dark-gray or almost black, fine sand, 4 to 12 inches deep, grading into a grayish to almost white, loamy fine sand, which passes at about 16 inches into a gray or mottled grayish and yellowish, loamy fine sand. From 30 to 36 inches there is usually a small content of clay, which imparts a slight stickiness.

As mapped this type is somewhat variable. The surface soil of the included areas ranges from almost a very fine sand or loamy fine sand to almost a sand. The subsoil may be uniformly gray, drab, or yellow, or it may be mottled throughout. Frequently the upper subsoil consists of a pale-yellow fine sand, which at about 18 to 24 inches passes into a bright-yellow or orange-yellow, loamy fine sand. In the northern part of the county the surface soil is generally higher in organic matter and has a darker color than elsewhere, and the subsoil is gray with very little yellow mottling, while in the vicinity of Yelvington the surface soil is a gray, loamy, fine sand. Most of the areas of Bladen fine sand contain patches of Portsmouth fine sand and Leon fine sand. In a few places the inclusions are so numerous that it is difficult to determine whether or not the Bladen fine sand is the predominating type.

The Bladen fine sand is the most extensively developed type in the western half of the county. Other areas occur in the southeastern corner of the county and west of Twelvemile Swamp.

The topography is flat or nearly flat and the drainage is poor, the ground-water table being near the surface. The soil is often soggy or covered with standing water during rainy periods.

The Bladen fine sand is one of the most important soils of the county. Probably 5 per cent of it is cultivated. The remainder is used for pasture. The type comprises the "grassy flatwoods," "prairie flatwoods," or "meadows" of the county, being characterized by scattered longleaf pine and a growth of wire grass, bunch grass, broom sedge, and occasionally such plants as sundew and pitcher plant.

The most important crops on this soil are Irish potatoes, corn, and cowpeas; about an equal acreage is devoted to each. Irish potatoes are the principal money crop. A large part of the corn is used to feed the work stock on the farm, some is used for the production of meat and dairy products to be used in the home or sold, and a small part is ground into meal and used in the home. The cowpeas are cut for hay or used as pasturage for fattening hogs and cattle. Sugar cane for sirup and sweet potatoes are grown for home use and for the market. Upland rice is grown to some extent, largely to be fed in bundles to stock. Only a small portion is thrashed for use in the home and for sale on the local markets. All the garden vegetables common to this region are produced, and small quantities are sold on the local markets. Practically all of the uncultivated land of this type provides open-range pasture for cattle and hogs, the stock being branded or otherwise marked. Most of the longleaf pine is boxed for turpentine. There are a few orange and grape-fruit orchards on this soil.

Irish potatoes yield from 10 to 85 barrels per acre, but because of the blight and excessive moisture during wet seasons the average return is only about 30 barrels. Corn yields 15 to 35 bushels per acre, averaging about 25 bushels, and sugar cane from 10 to 167 gallons of sirup per acre, averaging about 50 gallons.

Unimproved land of the Bladen fine sand sells at $20 to $50 an acre, the price depending on the condition of the roads, the extent of clearing and the location with respect to towns and railroad stations. The price of land cleared, fenced, and ready for cultivation ranges from $75 to $200 an acre, with an average of about $100 an acre.

Arrangements are being made to establish a State drainage district in the southwestern part of the county for the purpose of improving the drainage over a large tract. In all cases artificial drainage is necessary for the best agricultural use of this soil. The maintenance of organic matter in the soil also is essential. This need may be supplied by the liberal application of barnyard manure and by green manuring. The growing of leguminous crops greatly improves the soil and furnishes sufficient nitrogen so that this element may be largely eliminated in fertilizer mixtures. By plowing under cowpeas and velvet beans several farmers have obtained an improvement in the quality of Irish potatoes grown and an increase in production

of about seven barrels per acre, as well as a very substantial increase of yield in the succeeding corn crop. Bermuda grass makes good permanent pasture, and oats, barley, or rye sown in September or October provide good winter pasturage. Johnson grass, Rhodes grass, Para grass, and Natal grass have been grown on this type for hay. Citrus fruits and Muscadine grapes do well on this soil. It is well suited to the type of general farming practiced. Dairying, with the introduction of creameries and cheese factories, would make possible a steady income, would encourage the growing of legumes and other forage crops, and would make larger quantities of manure available. The raising of more beef cattle and hogs of better grades would be profitable.

Bladen fine sand, swamp phase.—The surface soil of the Bladen fine sand, swamp phase, consists of mucky material ranging from 1 to 12 inches in depth. Beneath this is a gray to dingy-gray or pale-yellow fine sand, passing in the lower subsoil into a sticky, yellow drab, or mottled yellow and drab fine sand or fine sandy loam. Lenses of fine sandy clay are present in places. Frequently there is no mucky material at the surface.

The Bladen fine sand, swamp phase, is one of the most extensively developed swamp soils of St. Johns County. The largest areas are in the northeastern part of the county and in Big Cypress Swamp in the southern part, but many other areas, ranging from a few to several hundred acres, occur in swamps and shallow basins in all parts of the county.

The surface of this phase is basinlike. It lies 1 to 4 feet below the general level of the typical Bladen fine sand, and is covered with water except during long dry periods. It supports a growth of long-leaf pine, slash pine, cypress, water oak, sweet gum, black gum, and myrtle, with sphagnum and club mosses in the wetter areas.

This land is used for pasture and turpentining. Lumber companies are cutting the cypress in the larger swamps. The soil is not cultivated, on account of the excessive moisture, but when drained it soon loses all swamp characteristics, appearing very much like low hammock land, and is adapted to all the crops grown on the typical Bladen fine sand.

BLADEN FINE SANDY LOAM.

The soil of the Bladen fine sandy loam consists of a gray to dark-gray or black, loamy fine sand, 5 to 12 inches deep, grading into a gray loamy fine sand, mottled with yellow. This gradually becomes heavier with increase of depth until the drab, bluish-drab, mottled yellow or brownish and drab, plastic clay subsoil is reached at 12 to 30 inches.

The type as mapped is not uniform. In many places the clay subsoil is very friable, owing to a large content of fine sand. The surface soil is occasionally mottled with yellow. In the southwestern part of the county the type as mapped includes some small areas of Scranton fine sandy loam, consisting of dark-gray or black fine sand passing at about 5 to 7 inches into grayish-yellow or pale-yellow fine sand which is underlain at 18 to 30 inches by a mottled yellow and gray sandy clay. Low-lying, dome-shaped mounds of Leon fine sand and St. Johns fine sand are also of common occurrence in the Bladen fine sandy loam areas, and there are many included irregular patches of Bladen fine sand.

The Bladen fine sandy loam is developed in large areas in the vicinity of Hastings. A number of small areas occur throughout the county. The surface is flat. The general elevation ranges from 5 to 30 feet. Before ditches were dug much of the cultivable soil was under water for a large part of the year.

This is one of the most important soil types of the county. Perhaps 50 per cent of it is under cultivation, comprising only the land improved by artificial drainage. The forested areas support a growth of longleaf pine, grasses, sedges, and saw palmetto; in places there is a heavy hammock growth, consisting of live oak, cabbage palmetto, gum, magnolia, myrtle, and groundsel bush.

The Irish potato is the chief crop, occupying an acreage about 20 per cent greater than that in corn, the next most important crop. Cowpeas, sugar cane, sweet potatoes, and oats, ranking in acreage in the order named, are other important crops. Rice, peanuts, velvet beans, Bermuda grass, Para grass, Sudan grass, Natal grass, rye, soy beans, and sorghum are grown to a small extent. There are a few good dairies on this type in the vicinity of Hastings, but most of the farmers do not keep cows to supply their own milk and butter. A few farmers in the vicinity of Hastings have commercial groves of oranges, tangerines, and grapefruit. Muscadine grapes do very well on this type, but are not extensively grown.

The producing of early Irish potatoes about Hastings has become the most important industry of the county. (See Pl. II, figs. 1 and 2.) The Hastings potato district, which is the largest and most important in the State of Florida, is confined very largely to this type. Early potatoes mature from about April 10 to May 1.

On the Bladen fine sandy loam Irish potatoes return from 10 to 100 barrels per acre, with an average of 30 or 35 barrels. The wide variation in yield is due in part to climatic conditions and to differences in the stand and in the efficiency of cultural practices. Corn ranges in yield from 15 to 45 bushels per acre, with an average of about 25 bushels, and sugar cane from 30 to 170 gallons of sirup, with an average of about 50 gallons.

This soil responds readily to good farming methods and fertilization. It is handled in practically the same way as the Bladen fine sand. Where potatoes are dug early, corn is planted after the potatoes, instead of on the side of the bed at the last working of the potatoes. In this case the potatoes are dug by modern machinery instead of by hand. Cowpeas, which follow the corn, together with the volunteer growth of crab grass, are usually cut for hay but are sometimes pastured.

All farmers use commercial fertilizer for Irish potatoes, and the same brands and quantities are used as on the Bladen fine sand. The application of manure gives good results. Cowpenning is very effective in fertilizing the land for sweet potatoes and other crops. During periods of extremely dry weather certain crops, especially Irish potatoes, suffer from lack of moisture. This is supplied by irrigation from artesian wells, by means of the same ditches that are used for drainage during periods of excessive moisture. The artesian water, because of its relatively high temperature, is also valuable in giving protection from frosts.

Uncleared areas of the Bladen fine sandy loam sell for about $35 to $100 per acre, the price depending upon the condition of the roads and the position with respect to towns and railroad stations. Improved farms range in price from $100 to $500 an acre.

The Bladen fine sandy loam is a strong and easily improved soil, but some fields have decreased in productiveness owing to the use of raw commercial fertilizer year after year in growing Irish potatoes followed by corn and cowpeas without the addition of organic matter. In the few cases where cowpeas have been plowed under green a very noticeable increase in the yield has resulted. More beef and dairy cattle and hogs could be profitably raised on this land. Corn and velvet-bean silage is an excellent feed for dairy and other cattle and should be fed much more extensively.

Bladen fine sandy loam, swamp phase.—The surface soil of the Bladen fine sandy loam, swamp phase, is a dark-gray to black loamy fine sand to fine sandy loam, underlain at depths ranging from 4 to 15 inches but ordinarily 7 to 10 inches by a dingy-gray or mottled yellow and gray fine sand to loamy fine sand. This passes into a mottled drab and yellow, yellow, or drab plastic to friable clay at about 14 to 30 inches. In the wetter areas the surface material often consists of 1 to 6 inches of black to brown Muck or Peat. In places the upper subsoil is a light-gray to almost white fine sand, which with increasing depth grades into a drab or mottled drab and yellow, plastic to friable clay. In some places the stratum of clay is 2 to 8 inches thick. Below the clay the material is a loamy fine sand.

This phase is not extensive, but it occurs in small bodies in many sections. The largest development is in the flood plain along Deep

Creek. Smaller areas occur in Big Cypress Swamp. While the surface is in general flat, it is broken along Deep Creek by sloughs, stream channels, and occasional depressions and inequalities due to erosion by overflow water. The natural drainage is very poor, water standing on the surface for long periods after heavy rains.

The phase is used as range for cattle and hogs. The areas in Big Cypress Swamp are forested with cypress, longleaf pine, slash pine, and myrtle, while those along the other streams support a growth of cypress, pine, gum, oak, magnolia, bay, cabbage palmetto, hickory, myrtle, and groundsel bush. When this phase is drained it will be found essentially similar to the typical Bladen fine sandy loam in its crop adaptations, and in fertilizer requirements and other farm practices.

The following table gives the results of analyses of samples of the typical soil and subsoil of the Bladen fine sandy loam:

Mechanical analyses of Bladen fine sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
261723	Soil	0.3	2.3	4.9	81.5	1.7	6.0	2.6
261724	Subsoil	.2	2.1	3.3	76.3	2.7	3.2	12.1

LEON FINE SAND.

The Leon fine sand consists of a gray to dark-gray fine sand, 1 to 5 inches deep, overlying a light-gray to almost white, rather incoherent fine sand which at depths varying from 8 to 30 inches, though usually at about 15 to 22 inches, passes into a dark-brown or rusty-brown and sometimes black, dense hardpan layer. This ranges from 3 inches to 2 feet in thickness, and is underlain by a white fine sand, which is always moist and compact but when distributed becomes incoherent and has the nature of quicksand. In St. Augustine, east of Magnolia Grove and east of Diego Landing, where the type supports a hammock vegetation, the surface soil contains considerable organic matter, owing to the addition of vegetable mold from the decaying leaves and other plant tissues, and has a somewhat darker color than typical, to a depth of a few inches. Included with the type are small areas of Portsmouth fine sand, Plummer fine sand, and Bladen fine sand, the extent of which did not warrant a separation.

The Leon fine sand is developed in nearly every section of the county, in areas ranging from a few acres to 2 square miles in extent. It lies slightly higher than the St. Johns fine sand and somewhat lower than the Norfolk fine sand. It occurs principally on sandy ridges which form the divides of streams in the flatwoods. The loose, open

structure of the soil and the low organic content tend to make the drainage excessive, and even under ordinary conditions crops suffer from lack of moisture. The hardpan layer, being impervious, prevents the capillary rise of moisture from the underlying saturated sand.

Practically none of this type is under cultivation, and it is generally considered of low productiveness. It is used mainly for grazing. The type supports a characteristic native vegetation of longleaf pine, scrubby saw palmetto, oak runner, wire grass, broom sedge, gallberry, dog fennel, and false huckleberry. Many of the longleaf pines are boxed for turpentine.

Land of this type sells for $5 to $50 an acre, the price depending upon the condition of roads and the distance from towns and lines of transportation.

This soil might be used for crops if the hardpan layer were broken up by deep subsoiling or by blasting, thus permitting the mosture to rise. The destructive practice of burning off the vegetation should be discontinued, and large quantities of organic matter should be supplied by the application of manure or the plowing under of green crops. Lime should be used to correct the acidity. The growing of leguminous crops, such as cowpeas, velvet beans, crimson clover, vetch, snap beans, or soy beans, would furnish nitrogen, so that this element could be partly eliminated in the fertilizer mixtures. Irrigation is necessary for the best agricultural use of the type. With irrigation and proper management and fertilization a large variety of vegetables could be grown.

Leon fine sand, scrub phase.—The scrub phase of the Leon fine sand is characterized by a stunted vegetation of evergreen oak. The soil is essentially the same as that of the typical Leon fine sand, except that the hardpan layer lies somewhat deeper, sometimes below the 3-foot section. This phase is not very extensive. It occurs in the extreme eastern part of the county, one-fourth to 3 miles from the ocean, occupying ridges which extend in a northwesterly and southeasterly direction parallel with the coast line. Other small areas occur at Tocoi and south of Picolata.

NORFOLK FINE SAND.

The surface soil of the Norfolk fine sand, to a depth of 5 or 6 inches, is a light-gray, incoherent fine sand, sometimes slightly darker at the surface owing to a higher content of organic matter. The subsoil to a depth of 36 inches or more is a yellowish-gray to pale yellow, loose fine sand. Occasionally both soil and subsoil are coarser or finer than typical.

This type occurs in large areas in the northwestern corner of the county along the St. Johns River and Julington, Trout, and Sixmile

Creeks; in the vicinity of Moultrie; and along Pellicers Creek. Small areas are developed near Orange Dale and Armstrong, and in nearly all parts of the eastern half of the county.

The Norfolk fine sand occurs characteristically on ridges or undulating highlands. Along streams the slopes are sometimes abrupt. Drainage is well established, and the areas on the crests of ridges and on the steeper slopes are inclined to suffer from excessive drainage by reason of the open, loose nature of the soil material.

Probably 25 per cent of the Norfolk fine sand is in cultivation, while the remainder serves as range for cattle and hogs. The virgin timber growth is longleaf pine, but where this has been removed forked-leaf blackjack oak has sprung up. Wire grass is common in the uncleared areas.

The principal crops on this type are corn, cowpeas, sweet potatoes, sugar cane, and peanuts. Corn yields 10 to 20 bushels per acre with fertilization. Each farm has a small garden to supply family needs. There are small orange groves about St. Augustine and Moultrie and along the St. Johns River. Citrus fruits give fairly good returns, but require heavy fertilization. Grapes of the Muscadine family do very well on this soil and are grown for making wine. There are a number of olive trees and Japanese persimmon trees on this type that are yielding a good profit. Pecans are grown with success, but in a small way. A very common and efficient method of fertilization practiced on this type is "cowpenning."

Uncleared land of the Norfolk fine sand has a value of $15 to $40 an acre, depending upon the location. Land cleared and ready for the plow ranges in price from $50 to $250 an acre, depending upon the farm improvements and the distance from town and transportation facilities.

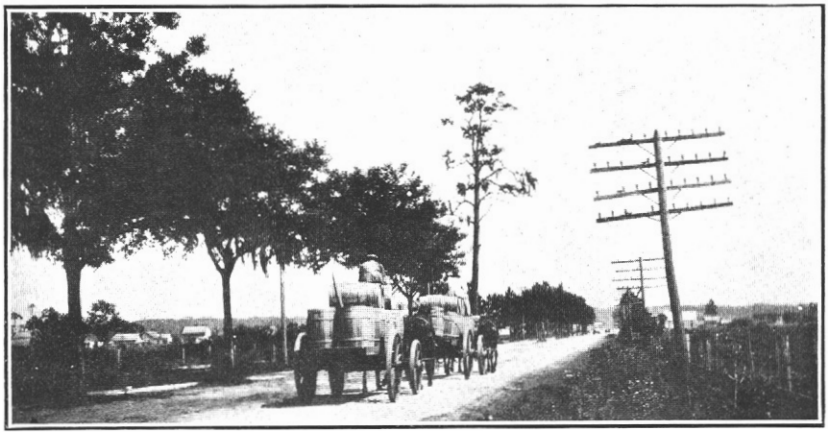
The Norfolk fine sand, owing to its topographic relief and loose, open structure, is droughty during dry periods. Irrigation is almost necessary for successful truck farming. Irrigation must be by the sprinkling method, as the deep, porous soil can not be subirrigated. The type is very deficient in organic matter, and the liberal application of barnyard manure and the plowing under of vegetation will increase the moisture-holding capacity and supply plant food. An application of lime would correct the acidity and would be especially helpful in growing the legumes. On this type of soil in other sections of Florida watermelons do very well with applications of about 1,000 pounds of fertilizer to the acre.

Norfolk fine sand, scrub phase.—The Norfolk fine sand, scrub phase, consists of a thin veneer of incoherent, white fine sand, usually less than 1 inch in thickness, but occasionally reaching 10 inches, underlain by pale-yellow, loose fine sand, which extends to a depth of 3 feet without any important change.

S. 9342

FIG. 1.—HARVESTING POTATOES ON THE BLADEN FINE SANDY LOAM NEAR HASTINGS.

Where potatoes are dug by hand both Negro men and women are employed. They receive the same wages.



S. 9346

FIG. 2.—HAULING IRISH POTATOES TO HASTINGS.

Note hard, level road, which enables the delivery of the potatoes at the shipping point with a minimum cost for haulage.

FIG. 1.—FIELD OF IRISH POTATOES ON THE ST. JOHNS FINE SAND.

The land occupied by the rows of larger plants on the right has been limed. The land under the rows of less vigorous plants on the left received no lime.

FIG. 2.—A FIELD OF RHODES GRASS ON THE ST. JOHNS FINE SAND.

To produce this growth the land received three-fourths ton of ground shell rock, and 2 tons of burnt lime per acre.

This phase is developed most extensively in the eastern part of the county, one-half mile to 5 miles from the coast, and occupies long, narrow ridges, 3 to 10 feet higher than the surrounding soils. Small areas occur along the St. Johns River south of Tocoi, and along Tocoi and Colsens Creeks.

The topography is rather billowy and shows evidence of wind erosion and deposition. The porous structure permits the rainwater to pass rapidly downward to considerable depths, resulting in excessive drainage.

Agriculturally the phase is not important. Possibly 1 per cent of it is farmed. It supports very little grass for grazing. The timber growth consists mainly of spruce pine, with some live oak, scrub oak, and longleaf pine. Saw palmetto, low-growing shrubs, and grapevines form the undergrowth. The suggestions made for the improvement of the typical Norfolk fine sand are applicable also to this phase.

Norfolk fine sand, hammock phase.—The Norfolk fine sand, hammock phase, to a depth of 2 to 7 inches is a light to dark-gray, loose fine sand, the darker color and somewhat loamy character of the material in places being due to the presence of organic matter. Below this is a yellow, pale-yellow, or grayish-yellow fine sand, which is sometimes slightly loamy. In places a dark-gray to rusty-brown, hardpanlike layer, a few inches thick, is encountered from 18 to 24 inches. The material both above and below this layer has the characteristic pale-yellow or yellow color of the Norfolk series. In places the texture of both the soil and subsoil approaches a medium sand.

This phase lies along Pellicers Creek east of Matanzas and the St. Johns River from Orange Dale to Pine Bluff. Small bodies occur at Racy Point, along McCullough Creek, and along the eastern border of the county within one-half mile to 3 miles of the coast. Its surface ranges from almost level to undulating or gently sloping. Drainage is good.

Although comparatively inextensive, the Norfolk fine sand, hammock phase, is an important soil. Probably 15 per cent of it is cultivated, while the remainder serves as range for stock. A distinguishing characteristic of the phase is its hammock growth, consisting principally of live oak, cabbage palmetto, magnolia, and hickory.

Practically the same crops are grown and the same yields obtained as on the typical Norfolk fine sand. The type can be improved by the methods suggested for the latter type.

Norfolk fine sand, flat phase.—The Norfolk fine sand, flat phase, consists of a gray to dark-gray, incoherent fine sand, underlain at

about 8 to 10 inches by a yellow, pale-yellow, or grayish-yellow incoherent fine sand, extending to a depth of more than 3 feet.

Where this phase grades into the Portsmouth fine sand the surface soil becomes very dark in color, because of the larger organic content, the upper subsoil is dingy or dull yellowish gray, and the lower subsoil is grayish yellow or pale yellow. This darker soil occurs on slight elevations within bodies of Portsmouth fine sand and Bladen fine sand.

The Norfolk fine sand, flat phase, occurs in many localities in small areas. The largest developments are in the vicinity of Armstrong, along Trout Creek and Flora Branch. The surface is flat to gently undulating, and drainage is fairly well established.

Perhaps 20 per cent of this phase is cultivated; the remainder is used as range for stock. The principal tree growth consists of longleaf pine, live oak, water oak, turkey oak, and blackjack oak. Where cultivated this soil is devoted to the same crops as the typical Norfolk fine sand. Yields are somewhat better. Muscadine grapes and pecans produce well.

Norfolk fine sand, shell phase.—The surface soil of the Norfolk fine sand, shell phase, to a depth of about 12 inches, is a dark-brown, loamy fine sand in which there are incorporated large quantities of oyster-shell fragments. The surface is thickly strewn with this material and the soil is known locally as "shell land." The subsoil is practically free from shell fragments and resembles that of the typical Norfolk fine sand in texture, structure, and color. The shell fragments apparently are the remnants of shells spread on the land prior to 1819 by the Spaniards. Writers state that the Spaniards used a method of improving the soil by covering it with shells and that in some instances this covering was a foot thick.

This phase occurs in small areas, principally along the Matanzas River. It is usually developed where a stream empties into the river, and lies slightly higher than the surrounding land. The drainage is good. Some of the first farms in St. Johns County were established on this soil. It is one of the most productive fine sands in the county, and about 30 per cent of it is under cultivation. It supports a hammock growth consisting of live oak, magnolia, hickory, bay, and cedar.

Corn, oats, and all vegetables do well on this soil. Irish potatoes produce fair yields. Lime, coming from the shells, keeps the land in a sweetened condition, so that it is especially adapted to the growing of legumes.

ST. JOHNS FINE SAND.

The St. Johns fine sand consists of a dark-gray to black, loamy fine sand, 5 to 10 inches deep, grading into a dingy-gray to almost white

fine sand which is underlain at depths ranging from 10 to 36 inches, but usually 18 to 24 inches, by a black to dark-brown, compact fine sand or so-called hardpan. This layer of hardpan, averaging 3 or 4 inches in thickness, but with a range of 1 to 24 inches, is underlain by a dark-brown fine sand, which passes abruptly into a wet, compact, gray fine sand. This when disturbed is loose and incoherent, and flows like quicksand. The black color of the surface soil is due to the presence of organic matter, the content of which varies from merely enough to impart a dark color to quantities sufficient to give a mucky character. The latter condition occurs in swampy areas.

In places a drab or yellowish-drab clay is encountered immediately under the hardpan, instead of the fine sand. This clay sometimes occurs within 3 feet of the surface, but the overlying hardpan tends to prevent the rise of capillary water from the subsoil so that the clay layer has little effect on the movement of water in the soil, except where the hardpan is broken with dynamite or by deep subsoiling. This has been done in the case of small hammocks and has resulted in a soil underlain by wet clay which supplies moisture through capillary action. Where the type occurs in association with the Leon and Bladen soils the surface soil tends to be lighter colored than typical. There are numerous included areas of Leon fine sand, Bladen fine sand, and Bladen fine sandy loam, the extent of which did not warrant separation.

The St. Johns fine sand is the most extensive soil in the county. It occurs in all parts of the flatwoods section. It is the predominating type in the eastern half and in the northwestern corner of the county. The surface is flat and the drainage is poor, water standing in the slight depressions for long periods after rains.

Less than 1 per cent of the type is under cultivation. Its chief use is that of a range for cattle and hogs. Practically all of the type supports a forest growth of longleaf pine, which is either boxed for turpentine or is being cut for lumber. Scrub saw palmetto, gallberry, wire grass, and broom sedge grow in most places.

In general, cultivation of this soil has been practically a failure, and there are numerous abandoned fields bearing witness to this fact. Nevertheless good yields of corn, Irish potatoes, strawberries, and Rhodes grass have been obtained where a mixture of 2 tons of ground limestone and 1 ton of slaked lime have been thoroughly worked into this soil, adequate drainage provided, and about the same applications of fertilizer made as in the case of the Bladen fine sand. (See Pl. III, figs. 1 and 2.)

This land is held at prices ranging from $5 to $40 an acre, depending upon the character of the range, the amount and quality of merchantable timber, and the distance from towns and lines of transportation.

The St. Johns fine sand can be made fairly productive. Means of improvement include artificial drainage, liming, and breaking the hardpan layer which obstructs the movement of moisture. After a few years of cultivation the organic matter in the surface soil is largely depleted, and the soil assumes a light-gray color like that of the Leon. It needs the application of large amounts of vegetable matter. In Bradford County, Fla., strawberries are grown extensively on this type, and in trucking sections it is used successfully for the production of celery, lettuce, beets, and tomatoes. The raising of more stock, especially beef cattle, would probably be profitable where there is so much waste land for pasture.

The following table gives the results of mechanical analyses of samples of the soil, subsoil, and lower subsoil of the St. Johns fine sand:

Mechanical analyses of St. Johns fine sand.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
261703	Soil	1.4	3.1	1.4	70.1	3.3	11.1	9.4
261704	Subsoil	.0	.8	.9	94.9	1.6	.8	.7
261705	Lower subsoil	.0	.8	.7	88.4	2.1	2.3	5.4

ST. LUCIE FINE SAND.

The St. Lucie fine sand, to a depth of 36 inches or more, consists of a loose, incoherent, light-gray to white fine sand. No hardpan is encountered in the 3-foot section, but one may occur at lower depths. In some places a pale-yellow fine sand is encountered below 16 to 30 inches.

This type occurs principally on the higher ridges in the areas of Leon fine sand. The principal developments are in the eastern part of the county, where the type occupies long, narrow ridges running parallel with the coast line.

The St. Lucie fine sand, because of its excessive drainage and its lack of organic matter, is practically worthless for ordinary crops and is not farmed. The timber usually consists of a dense growth of scrubby evergreen oak and some spruce pine, but in places there is some longleaf pine. There is an undergrowth of saw palmetto, rosemary, oak runner, and a few other plants.

Organic matter must be supplied, by the liberal application of barnyard manure or by plowing under vegetation, before any degree of success in growing crops can be hoped for. Farther south, along the east coast of Florida, where the climatic conditions are favorable, this soil, with heavy fertilizations, is used extensively for the production of pineapples.

SCRANTON FINE SAND.

The surface soil of the typical Scranton fine sand consists of about 8 to 10 inches of dark-gray or black, loamy fine sand, underlain by grayish-yellow or yellowish-gray fine sand which has brownish-yellow mottlings. In Palm Valley, in the northeastern part of the county, the surface soil is a black, loamy, compact fine sand, ranging from 10 to 20 inches in depth and having a very high content of organic matter. At this depth a substratum is encountered, resembling somewhat the dark-brown hardpan of the Leon and St. Johns soils but differing in being very friable and less compact. Underlying this is a yellow fine sand, which often becomes loamy or slightly clayey with increase in depth. In the vicinity of Turnbull Swamp the dark-brown to black surface soil passes at about 8 to 12 inches into a few inches of hardpanlike material. This is underlain by a loamy or clayey, yellow fine sand to a depth of 36 or 40 inches, where a heavy substratum of dark-brown hardpan is encountered.

This type occurs in Palm Valley, west of Twelvemile Swamp, and in the north-central and northwestern parts of the county. The surface is usually flat to slightly sloping. The type often occupies the brow or break of the gentle slopes along streams. Drainage is better than that of the St. Johns and Portsmouth soils, because of the slightly higher elevation or the sloping surface.

Only a small percentage of this type is cultivated, the remainder being used as open range for stock. The predominating tree growth is longleaf pine, with some black pine and slash pine. Runner oak is a characteristic shrub growth. In Palm Valley the forest growth differs from that in other sections, consisting of live oak, magnolia, cabbage palmetto, longleaf pine, and black pine.

Irish potatoes, corn, sweet potatoes, and sugar cane are grown on this soil, and do better than on the average soil of the county. The "cowpenning" method of fertilization is practiced.

PLUMMER FINE SAND.

The surface soil of the Plummer fine sand is a gray to dark-gray fine sand, 4 to 8 inches deep. The immediate surface material is high in organic matter, which gives it a dark color and a loamy feel. The subsoil is a light-gray or dingy-gray, loose fine sand, with the nature of quicksand. In some places the subsoil is mottled with yellow, and in others it is pale yellow throughout. Included with the type are small mounds of Portsmouth fine sand and Leon fine sand, which are conspicuous because of a growth of saw palmetto and gallberry bushes. In many places the type passes so gradually into the Bladen

fine sand that it is very difficult to determine where the boundaries between the two types should be placed.

The Plummer fine sand occurs in comparatively large areas along McCullough Creek, south of Bakersville School, southeast of Spuds, north of Yelvington, and southwest of Gopher Ridge. A number of small areas are scattered throughout the county.

The type occupies flat, poorly drained areas. The subsoil is water-logged except during long dry periods.

The Plummer fine sand is unimportant in the agriculture of the county. It is not under cultivation, but is used for grazing. The soil supports a scattering of longleaf pine and slash pine, with a growth of wire grass, broom sedge, sundew, pitcher plant, saw grass, bunch grass, crab grass, and rushes.

Land of this type ranges in selling price from $5 to $40 an acre, the price depending largely upon the location.

Plummer fine sand, swamp phase.—The swamp phase is similar to the typical Plummer fine sand in color, structure, and texture of the soil material. It is distinguished by the prevailing swampy or marshy conditions. The surface soil is a gray to dark-gray, somewhat loamy, fine sand, passing at about 4 to 8 inches into gray or dingy-gray, loose fine sand, which continues to a depth of more than 3 feet with almost uniform texture and structure.

This phase is developed in large areas south and east of Bakersville School. Smaller areas occur in almost every part of the county, usually along stream courses or in shallow basins. Drainage is very poor, the soil being submerged during the wet season.

The Plummer fine sand, swamp phase, is unimportant in the agriculture of the county. Its principal use is as range for cattle and hogs. The forest growth in the large swamp areas consists mainly of cypress and slash pine, but in the smaller, especially those along branches, there is a growth of sweet gum, swamp maple, bay, magnolia, water oak, and myrtle in addition to cypress and slash pine.

Owing to its porous and loose structure, this soil in general can best be used as range for stock. Some areas in the southwestern part of the county, grading toward the Bladen fine sand, could be improved by proper drainage, irrigation, and fertilization so as to give fairly good yields of truck and general farm crops.

PORTSMOUTH FINE SAND.

The Portsmouth fine sand consists of a very dark-gray to black, loamy fine sand, high in organic matter, to mucky fine sand, grading at a depth of about 6 to 14 inches into a gray fine sand which is sometimes mottled with yellow or brown in the lower part of the subsoil. The lower subsoil is usually saturated, and where exposed the

material has a tendency to flow like quicksand. In narrow strips along the St. Johns River, where the type supports a heavy hammock growth, the black surface soil is almost a fine sandy loam.

This type is of small extent. The principal areas occur south of Julia, southeast of Orange Dale, and along the eastern side of the county. The surface is flat and wet, and without artificial drainage this soil can not be used for general farming. The vegetation consists of scattered longleaf pine and a rather heavy growth of grasses.

A few basinlike prairie areas are included with the type. These are covered with water for the greater part of the year. These areas when drained would produce corn and cabbage.

Portsmouth fine sand, swamp phase.—The swamp phase of the Portsmouth fine sand consists of 5 to 12 inches of black, loamy fine sand to black mucky fine sand or loam, underlain by a light-gray to gray fine sand which extends to depth of more than 3 feet. In places the surface soil consists of black finely divided Muck and fine sand to a depth of 8 to 20 inches.

This phase is developed in the swampy basins of the flatwoods and in drainageway depressions where the flow is intermittent and sluggish. It is characterized by a heavy growth of cypress, bay, hickory, sweet gum, black gum, swamp maple, water oak, ash, slash pine, black pine, myrtle, cabbage palmetto, and magnolia, often with an almost impenetrable network of vines, briers, and shrubs.

Only a few acres of this soil have been drained and put under cultivation, but some of the best corn crops in the county have been grown in these fields. Onions, celery, and cabbage would probably give good results. Additions of lime are usually beneficial on soils of this character after they have been drained.

PARKWOOD FINE SANDY LOAM.

The surface soil of the Parkwood fine sandy loam is a dark-gray fine sandy loam, 2 to 6 inches deep, passing into a brownish-gray or gray fine sand that extends to a depth of about 6 to 16 inches. The upper subsoil varies from a yellow or gray, calcareous fine sandy loam to a mottled yellow and gray, gray, or dark-brown, calcareous clay loam or clay. This, at about 16 to 20 inches, is underlain by light-gray, mottled gray and yellow, or nearly white, sandy, marly clay. Usually the calcareous material increases with depth, and in spots the lower subsoil is almost a pure white marl. In some places the marl passes into a substratum of light-gray or bluish-white fine sand; in others a noncalcareous, stiff, drab or bluish-drab clay underlies the marly clay. Sometimes small fresh-water shells are scattered over the surface and mixed with the soil material throughout the 3-foot section.

The largest areas of this soil lie south of Moses Creek in the southeastern part of the county and west of North River bridge in the northeastern part. Small areas occur southwest of Hastings and along McCullough and Mill Creeks.

The type characteristically occurs in shallow basins or low hammocky areas. The drainage is very poor, water standing on the surface over a large part of the type during rainy seasons.

The Parkwood fine sandy loam is considered a very productive soil, but because of its poor drainage and the cost of removing the heavy hammock growth less than 5 per cent is cultivated. The timber growth is especially heavy and the trees are large. The growth consists of live oak, water oak, slash pine, longleaf pine, black pine, cedar, cabbage palmetto, sweet gum, black gum, ironwood, hickory, tulip, holly, red elm, swamp maple, ash, and persimmon. In places there is an undergrowth of vines, saw palmetto, briers, myrtle, and shrubs. There are places where the tree growth is confined almost wholly to cabbage palmetto, and in other places there is a mixed growth of hardwoods and pine, with a scattering of cabbage palmetto.

Uncleared tracts of the Parkwood fine sandy loam are held at $25 to $100 an acre, the higher values prevailing near towns and lines of transportation.

In most cases this type is favorably situated for artificial drainage. With good drainage it is especially well suited to the production of the general farm crops and to trucking. On Drayton Island, Putnam County, Fla., citrus fruits have done very well on this type of soil with comparatively little fertilization.

PARKWOOD CLAY.

The Parkwood clay consists of a dark-drab to black, heavy, plastic clay, 6 to 10 inches deep, resting upon a lighter colored clay, which grades into a grayish-drab clay mottled with yellow. This contains marl and in many places shell fragments. The lower subsoil is a bluish-drab sandy clay. On Pine and White Oak Islands, near the junction of Deep Creek and St. Johns River, the soil is underlain by a dark-gray plastic clay which passes into a sandy clay loam below 24 inches.

This type is inextensive. A small area occurs on the east side of Twelvemile Swamp. The surface is flat, and the drainage is very poor. The tree growth consists of cabbage palmetto, cedar, swamp maple, live oak, water oak, cypress, and magnolia.

Because of its poor drainage the Parkwood clay is not farmed. When drained it will be a strong, productive soil, particularly adapted to the growing of corn, legumes, and general farm crops.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of the Parkwood clay:

Mechanical analyses of Parkwood clay.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
261713	Soil	0.0	0.9	0.5	34.3	4.2	32.1	27.0
261714	Subsoil	2.3	4.8	1.8	26.9	5.1	27.4	31.3

PEATY MUCK.

The typical Peaty muck consists of black or dark-brown, fibrous to rather finely divided vegetable matter mixed with a small amount of mineral matter, mainly fine sand. This usually is underlain at 12 to 24 inches by a gray fine sand, but in a few cases by a gray or drab clay. Included with the Peaty muck in places are areas of Peat, where the fibrous vegetable matter is more than 3 feet deep and is almost free from grit.

The Peaty muck is developed most extensively in Shingle, Dead Mans, and Pacetti Bays, and St. Marks Pond. Small areas are scattered throughout the county.

This soil is not farmed. It furnishes some mast for hogs. In most cases it supports a growth of bay, magnolia, sweet gum, black gum, myrtle, water oak, ash, swamp maple, hickory, titi, briers, and vines, but there are some prairie areas, as around St. Marks Pond, in which areas there is a rank growth of saw grass, needle grass, bunch grass, and dog fennel.

Until drained the Peaty muck can not be used for agriculture. With proper drainage and the application of lime to correct the acidity, this soil will be found well adapted to celery, onions, cabbage, tomatoes, and Irish potatoes.

SWAMP.

Swamp includes the flood plains along creeks and the larger branches, and other low-lying areas that are more or less covered with water throughout the year and comprise such an intermingling of soils that it is practically impossible to separate them into series and types. In many places the surface material is somewhat mucky, and in others, as in the swamp along Deep Creek, a peaty muck or peat from 6 inches to 2 feet in thickness overlies a loose, gray fine sand. The material in the flood plains of streams is often a mixture of soils, including the Bibb fine sand, a light-gray fine sand extending to a depth of 3 feet or more; the Ochlockonee fine sand, a brown loamy fine sand underlain by a mottled brownish, yellowish, and gray fine sand; and the Johnson fine sand, a dark-gray fine sand passing into a gray or mottled gray and yellow fine sand. In some

cases the loams, clay loams, or clays of the Bibb, Ochlockonee, and Johnson series are encountered. There are a number of places where mucky material or gray fine sand is underlain by marly clay.

The Swamp areas are extensive. The largest occur in Twelvemile Swamp and along the St. Johns River, both north of Hastings and north of Tocoi. Smaller areas occur in every part of the county.

This land is considered of no agricultural importance except for grazing. The tree growth is heavy, and along creeks and branches consists of cypress, sweet gum, black gum, water oak, turkey oak, live oak, slash pine, water maple, hickory, ash, elm, cabbage palmetto, magnolia, bay, tulip, persimmon, and ironwood. Cypress is the predominating tree in the larger and wetter swamps. Cedar grows where there is a marl subsoil.

If well drained the Swamp would include some very good farming soil. This is especially true of the heavier developments and those having a marly subsoil.

TIDAL MARSH.

Tidal marsh comprises low-lying, wet areas subject to salt-water inundation at times of high tide. The soils vary from fine sand to clay, Peat, Peaty muck, and Muck beds.

The principal areas of Tidal marsh occur along the Matanzas, San Sebastian, North, and Guano Rivers. The areas are comparatively extensive. Agricultural development, aside from grazing and the cutting of marsh hay, is almost impossible, on account of the inundations and the salty condition of the soils, which preclude the growth of plants other than those of a salt-tolerant character. Salt weed and sword grass are the characteristic plants. Much of the Tidal marsh could be reclaimed by diking, but this would be very expensive and impracticable under present conditions.

COASTAL BEACH.

The Coastal beach soils consist of gray or light-colored incoherent siliceous sands mixed with small amounts of broken shells. In basin-like areas, occurring between ridges or sand dunes, the surface material has a dark-gray color, due to the presence of organic matter.

The Coastal beach soils are confined to a belt which usually extends back 100 to 600 yards from the ocean. In the vicinity of South Beach and Chautauqua Beach, the belt varies from one-half to 1 mile in width. From the water's edge to the base of the barrier the surface is smooth, but the remainder of the Coastal beach consists of a series of broken ridges running parallel with the coast. Everywhere there are evidences of wind action and in many places a dunelike topo-

graphy has been developed. Because of the loose and porous structure of the soil the drainage is excessive.

These soils are not farmed, and they furnish only a very small amount of grazing. The vegetation consists of saw palmetto, scrub oak, Christmas berry, and a very sparse growth of grasses. Because of the excessive drainage and the salt spray, which is often carried back for half a mile and is detrimental to the growth of most plants, the land has no agricultural value except for the scant grazing. Its chief value is for residence and resort sites near the ocean.

COQUINA.

The type mapped as Coquina consists of stratified shell fragments, belonging principally to the Coquina clam, but to a lesser degree to the conch, oyster clam, and other shell-bearing mollusks. Some of the strata consist of finely divided shell fragments and others of coarse shell fragments. The strata vary from well-cemented shell rock to loose shell fragments. The white and brown shells give a speckled appearance to an exposed section. In places a shallow covering of dark-gray to brownish fine sand overlies the Coquina material. The Coquina grades into the Coastal beach sands, which are in many places underlain by the Coquina beds. Included with the Coquina are a few small areas of loose shells in the form of mounds built up artificially.

The Coquina is typically developed on Anastasia Island, occupying a narrow ridge, which extends southward from the lighthouse for a distance of about 6 miles.

The Coquina forms nonagricultural land. The land supports a growth of cedar and live oak.

The value of the Coquina beds as building material has long been recognized. The indurated formation was the chief building material used in the early days of St. Augustine. Fort Marion was built of this material cut into blocks. The loose material is used with cement in making blocks, such as were used in the building of the Ponce de Leon Hotel.

SUMMARY.

St. Johns County is located in the northeastern part of Florida. It has an area of 607 square miles, or 388,480 acres.

The county consists of an almost level area broken along the coast and to a lesser degree along streams by low ridges. The principal watershed extends across the county in a northwesterly direction. West of this divide the streams flow west and northwest to the St. Johns River; to the east the drainage is carried eastward and southeastward to the Atlantic Ocean.

Elevations range from sea level to 62 feet above. The average elevation of the county is about 27 feet.

The first settlement in Florida was made at St. Augustine in 1565. Settlers have come from all parts of the United States and Canada, and there has been a steady growth of population. During the last 20 years there has been a very rapid increase of population in the southwestern part of the county, due to the development of the potato-growing industry.

St. Augustine, with a population of 5,494, is the principal town. Hastings is the chief shipping point of the State for early Irish potatoes.

The county is fairly well supplied with transportation facilities, all points being within 10 miles of a railroad station or a steamboat landing. The Dixie Highway, a brick road, passes through the county, and in addition there are a number of shell and other graded roads.

The climate of St. Johns County is subtropical. It is characterized by long summers and short, pleasant winters. The mean annual temperature at St. Augustine is 69.4° F., and the mean annual precipitation 47.98 inches. There is a normal growing season of 310 days.

The selling price of the better farming land ranges from $30 to $100 an acre for unimproved areas, and from $100 to $500 an acre for improved areas.

Early Irish potatoes are by far the most important crop. The potatoes are shipped principally to the northern cities. Corn, cowpeas, sugar cane, sweet potatoes, and oats, ranking in acreage in the order named, are grown rather extensively. Velvet beans, peanuts, sweet clover, various grasses, saccharine sorghum, rye, soy beans, snap beans, lima beans, milo, and kafir are planted to a small extent. The growing of citrus fruit and Muscadine grapes receives some attention.

There are a few good dairies near St. Augustine and Hastings, and the raising of beef cattle and hogs is of local importance. Not enough beef and pork are produced to supply the home demand. The hogs are being improved by the importation of pure-blooded boars and sows. Presence of the Texas-fever tick has so far prevented similar improvement in dairy and beef cattle.

All farmers use fertilizer for Irish potatoes. Corn and other crops following potatoes are not fertilized, but receive benefit from the fertilizer applied to the potatoes.

The soils of St. Johns County vary from loose sands to heavy clays and Peaty muck, but fine sands predominate. In topography and drainage there is a range from shallow, undrained basins, through flat, poorly drained areas to excessively drained ridges. On the basis of origin the soils are classed in three general groups, residual, alluvial, and cumulose. The residual soils are classed in the St. Johns,

Bladen, Norfolk, Plummer, Leon, St. Lucie, Parkwood, Scranton, and Portsmouth series. To the alluvial soils belong some of the Bladen, Parkwood, Plummer, and Portsmouth areas along streams. The Peaty muck is the only representative of the cumulose soils.

The St. Johns soils are the most extensive. Their chief use is as range for cattle. Less than 1 per cent of these soils is under cultivation. Where the land has been properly ditched, fertilized, and treated with lime, it has given good yields of Irish potatoes and corn.

The Bladen fine sand is one of the most extensive and important soils of the county. About 5 per cent of it is cultivated, the remainder being used as an open range for cattle and hogs. Irish potatoes, corn, cowpeas, sugar cane, and upland rice do very well on this soil. The Blanden fine sandy loam is the best Irish-potato soil of the county. About 50 per cent of it is cultivated. Its swamp phase is not cultivated, on account of the excessive moisture.

The Norfolk soils are well drained and warm natured, being especially adapted to early truck crops, sweet potatoes, and sugar cane. Corn, cowpeas, and upland rice are also grown. Citrus fruits and Muscadine grapes do very well. The yields on the hammock phase are about equal to those on the typical fine sand type, and the shell phase and flat phase are a little more productive, but the scrub phase gives slightly lower yields.

The Plummer soils are characterized by their light-gray to dingy gray subsoils. They are poorly drained and are not under cultivation, being used for grazing.

The Leon soils are well distributed throughout the county, but they are not cultivated. They are considered poorly adapted to crops. They need irrigation, the addition of organic matter and lime, and blasting or deep subsoiling to open the hardpan layer of the subsoil.

The St. Lucie fine sand is white in color. Because of its lack of organic matter and its excessive drainage it is considered almost worthless.

The Parkwood soils occur in shallow basins or in low hammock areas. In both situations they are very poorly drained. They have marl or marly clay subsoils. These soils are very productive when drained, and are especially adapted to legumes and corn.

The inextensive Portsmouth and Scranton soils occur in low, flat, poorly drained areas, and are almost undeveloped. When drained they make good corn and truck soils.

Coastal beach, Swamp, Tidal marsh, and Coquina do not represent sufficiently definite material to be classed in any series. These areas are not cultivated, but are used to some extent for grazing.

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[PUBLIC RESOLUTION—No. 9.]

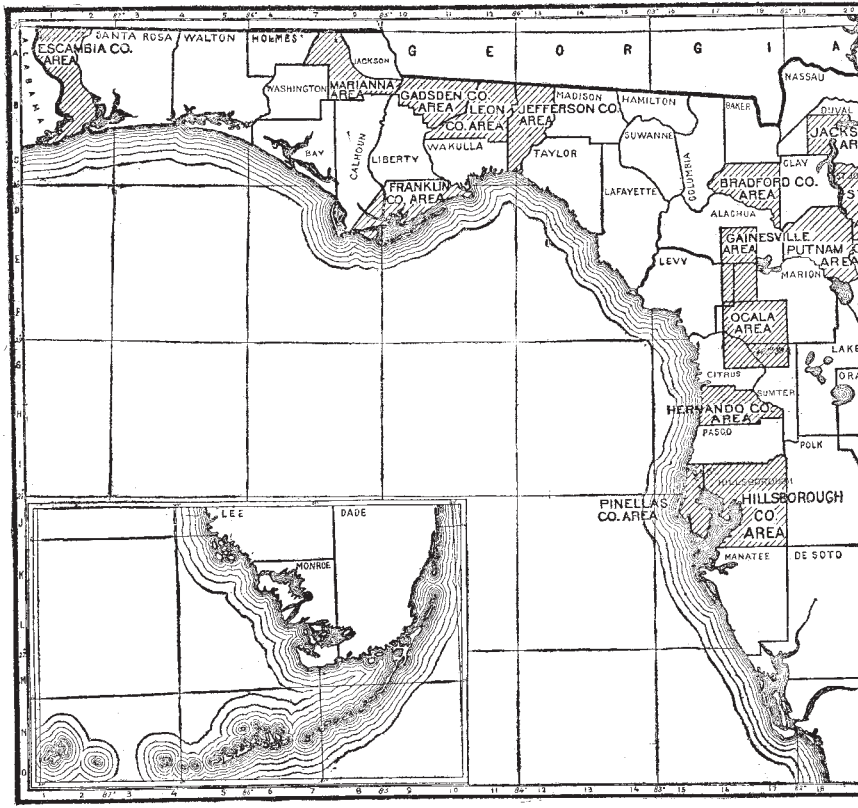
JOINT RESOLUTION Amending public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, "providing for the printing annually of the report on field operations of the Division of Soils, Department of Agriculture."

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, be amended by striking out all after the resolving clause and inserting in lieu thereof the following:

That there shall be printed ten thousand five hundred copies of the report on field operations of the Division of Soils, Department of Agriculture, of which one thousand five hundred copies shall be for the use of the Senate, three thousand copies for the use of the House of Representatives, and six thousand copies for the use of the Department of Agriculture: *Provided,* That in addition to the number of copies above provided for there shall be printed, as soon as the manuscript can be prepared, with the necessary maps and illustrations to accompany it, a report on each area surveyed, in the form of advance sheets, bound in paper covers, of which five hundred copies shall be for the use of each Senator from the State, two thousand copies for the use of each Representative for the congressional district or districts in which the survey is made, and one thousand copies for the use of the Department of Agriculture.

Approved, March 14, 1904.

[On July 1, 1901, the Division of Soils was reorganized as the Bureau of Soils.]



Areas surveyed in Florida.

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U. S. DEPT. OF AGRICULTURE
BUREAU OF SOILS
MILTON WHITNEY, CHIEF
CURTIS F. MARBUT, IN CHARGE SOIL SURVEY

SOIL MAP

FLORIDA
ST. JOHNS COUNTY SHEET

LEGEND

- Bladen fine sand — Ba
- Parkwood fine sandy loam — Pk
- Swamp phase — Bs
- Parkwood clay — Pc
- Bladen fine sandy loam — Bf
- Plummer fine sand — P
- Swamp phase — Bf
- Swamp phase — P
- Leon fine sand — Lf
- Portsmouth fine sand — Pf
- Scrub phase — Lf
- Swamp phase — Pf
- Norfolk fine sand — Nf
- St. Johns fine sand — Sf
- Scrub phase — Nf
- St. Lucie fine sand — Ss
- Hammock phase — Nf
- Scranton fine sand — So
- Flat phase — Nf
- Swamp — S
- Shell phase — Nf
- Tidal marsh — T
- Coastal beach — Cb
- Peaty muck — Pm
- Coquina — Co

CONVENTIONAL SIGNS

CULTURE
(Printed in black)

City or Village, Roads, Buildings, Wharves, Jetties, Breakwater, Levee, Lighthouse, Fort
Secondary roads and Trails
Railroads, Steam and Electric
Bridges, Ferry
R.R. crossings, Tunnel
Ford, Dam
School or Church, Cemeteries
Mine or Quarry, Mine dumps, Made land
Bluff, Escarpment, Rock outcrop, and Triangulation station
Stony and Gravelly areas
Soil boundaries
Boundary lines
Boundary lines
Boundary lines
U. S. township and section lines

RELIEF
(Printed in brown or black)

Contours, Depression contours
Prominent Hills, Mountain Peaks
Sand Wash and Sand dunes
Shore and Low-water line, Sandbar

DRAINAGE
(Printed in blue)

Streams
Lakes, Ponds, Intermittent lakes
Intermittent streams
Springs, Canals, and Ditches, Flumes
Swamp, Salt marshes
Submerged marsh, Tidal flats

The above signs are in current use on the soil maps. Variations from the signs appear on the maps of earlier date.

W. Edward Hearn, Inspector, Southern Division
Soils surveyed by Arthur E. Taylor, in charge,
Grove B. Jones, E. C. Hall, and Charles N. Mooney.

BASE MAP IN PART FROM
U. S. GEOLOGICAL SURVEY SHEETS AND
U. S. COAST AND GEODETIC SURVEY CHARTS

1 ½ 0 1 2 3 4 Miles
Scale 1 inch = 1 mile

Field Operations
Bureau of Soils
1917.